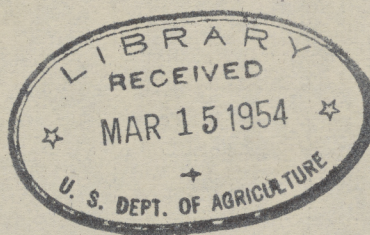


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PRACTICAL MOSQUITO CONTROL IN MULTNOMAH COUNTY, OREGON
under the Works Progress Administration
December 23, 1935 to December 22, 1936

By
C.E. Cody



Sponsors: Multnomah County and the City of Portland
Portland, Oregon, December 30, 1936

INTRODUCTION

The work of the project consisted of three distinct and separate operations, direct control by oil spraying, the making of contour maps by an engineering party, and the clearing of brush and debris from known mosquito breeding grounds, in order to change the ecology and facilitate oiling procedure..

PERSONNEL AND DUTIES

The supervisory staff consisted of H. H. Stage Associate Entomologist, with the United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, acting in the capacity of technical advisor. R. L. Deaver Resident Engineer, was with the project from December 23, 1935 to July 1, 1936. From July 1, 1936 to December 22, 1936 E. B. Brownrigg acted as resident engineer. W. W. Yates and C. E. Cody were superintendent and assistant superintendent, from December 23, 1935 to July 1, 1936. From July 1, 1936 to December 22, 1936, C. E. Cody worked as project entomologist.

The duties of the technical advisor were to designate the areas where the work was to be done and the manner and procedures to be followed in each specific area. Instructions were given to the engineering party, as to the type of data necessary for the making of a contour map showing the relationship of flood water to the mosquito-breeding grounds situated along the shores of the Columbia and Willamette Rivers, and the subsequent affect of various crest heights on these areas. He also assisted, by giving advice, in straightening out any difficulties which arose in the field.

The duties of R. L. Deaver and E. B. Brownrigg Resident Engineers, who worked out of the W. P. A. Division of Operation office, remain somewhat in doubt; however as near as they can be defined they consisted of ordering supplies and equipment, signing labor releases, routine inspection of the work, preparing a monthly report for their superior as to the progress of the work, and to determine if the project was in anyway violating the numerous rules and regulations covering a multitude of situations relative to the W. P. A. works program.

It is rather difficult to definitely establish a limit to the duties of the resident engineers, as it seemed as though there were no hard and fast rules to be followed. Old rules were disregarded and new ones established to suit the occasion.

W. W. Yates Superintendent, was in direct charge of all labor crews, directing and advocating the manner of work to be done in the field. He also handled all land easements and correspondence relating to the project.

C. E. Cody, the author, working as assistant superintendent reported directly to the superintendent and assisted him in the direction of the work in the field. He also had charge of all tool requisitions from December 23, 1935 to July 1, 1936. From April 1, 1936 to July 1, 1936 he had immediate charge of direct control measures by oiling which were carried out by five crews consisting of one entomological scout and six laborers per crew. The assistant superintendent also had immediate charge of the engineering party from April 1, 1936 to December 22, 1936.

Because of continual misunderstandings and disagreements between H. H. Stage Technical Advisor, W. W. Yates Superintendent, and C. E. Cody Assistant Superintendent with members of the W. P. A. Supervisor of Operation's office, the project was reorganized on July 1, 1936. Just prior to the reorganization, W. W. Yates resigned because he felt the worry caused by the continual bickering and uncooperative spirit shown by members of the W. P. A. engineering division was beginning to affect his health. After the reorganization, the positions of superintendent and assistant superintendent were abolished, and only 25 laborers were retained to carry on the field work. Because H. H. Stage insisted that some technically trained man be retained, the author was given the created position of project entomologist. He worked as project entomologist from July 1, 1936 to December 22, 1936. The duties of this position were absolutely devoid of any connection with the officials of the W. P. A., and consisted mainly of assisting the technical advisor and inspecting and reporting the calibre of the work being done to him.

COOPERATIVE FEATURES of the PROJECT

Because mosquito control benefits every individual in the county, the City of Portland and Multnomah County acted as sponsors of the project. The city furnishing \$ 1000. and the county \$ 1233. in order to secure \$ 161,653. of federal or W. P. A. funds.

ADAPTABILITY of RELIEF LABOR to MOSQUITO CONTROL

Practically all work done on a mosquito-control project of this type requires a number of unskilled laborers for such hand labor as ditching, filling, brush clearing, and oiling in the spring when the larvae are hatching. Because of the benefits obtained by such a large number of private citizens and the easiness which individuals from every walk of life can be employed, mosquito-control projects offer ideal employment to work-relief organizations. For instance, on questioning 59 laborers in the field, it was found that 33 occupations were represented, and only 14 had held previous positions as common laborers. A brief list of the former occupations of these laborers may serve to illustrate the ease by which relief labor may be employed on mosquito-control projects.

There were several accountants and contractors, approximately 15 painters, electricians, carpenters, and clerical workers. Radio technicians, peace officers, telegraph operators, cooks, and linotype operators were also represented.

PREVIOUS WORK of this kind in MULTNOMAH COUNTY

There has been considerable mosquito-control work done in Multnomah, County previous to the Works Project Administration. Under the Civic Emergency Relief in October 1931, a mosquito-control project employing relief labor to the extent of thirty men for one month was organized. However, the public response to a project of this type was so favorable and relief labor was utilized under such ideal conditions that the project was extended until January 1; 1932. Labor conditions were so favorable that the payroll was increased to 300 men in November and 250 in December. During these three months, a labor expenditure equivalent to 12,950 man days at a cost of \$ 56,528.25 including supervision was used to clear underbrush from 1,790 acres and ditch 3,600 lineal feet of mosquito-breeding areas.

From January, 1932 to December, 1933 there was no mosquito-control work done in Multnomah, County with the exception of direct control measures by oiling, which were carried on by the City of Portland and Multnomah, County during the spring months when the larvae were hatching.

During the winter of 1933 - 34 from December to April, an extensive mosquito-control campaign was inaugurated in Oregon and Washington under the Civil Works Administration. In Oregon alone from December to February, while the work was being done as a federal project, 1000 men were employed. From February 15th, to April 1st, 1934 the work was continued as a state project, but the number of men employed was rapidly reduced until on April 1st, all work was discontinued. Under the Civil Works Administration Mosquito-Control Program in Oregon and Washington, 4,929 acres of mosquito-breeding grounds were cleared of all underbrush and debris, 159,658 lineal feet of ditching was completed, 200 acres of land was drained, and 2,570 cubic yards of fill was made at an expenditure of 385,203 man hours at a cost of \$ 206.354 for labor and supervision.

A small mosquito-control project under the auspices of the State Emergency Relief Administration operated in Multnomah, County employing approximately 50 men per week for a period of 19 weeks from May to September, 1934. The work consisted of direct control measures by oiling, brush clearing to the extent of 305 acres, 1,330 lineal feet of ditching, and 1,183 cubic yards of fill was completed at an expenditure of \$ 11,563. for labor and supervision.

LOCATION of WORK

As this project was sponsored by Multnomah, County and the City of Portland, no work was done outside of the county boundaries even though several areas just over the county limits produced an abundance of mosquitoes which proved bothersome to county residents.

The nine-labor crews were placed throughout the county in areas known to be prolific mosquito producers. Crew # 1 was placed in the area known as the Oaks Bottom which is adjacent to and produces mosquitoes affecting several extensive residential districts, as well as a section of the business district of the City of Portland. Crew # 2 was placed in an area known as Mock's Bottom, which also produces mosquitoes affecting a large residential neighborhood. The business district of the city is also within the flight range of the mosquitoes produced there. Crews # 3 and 4 were placed on Hayden Island, an island approximately four miles long and three-quarters mile wide, which is almost entirely a prolific mosquito-breeding area. The insects produced at this area seriously affect Portland's largest amusement park, several tourist camps, a large riding academy, and the entire residential district situated on the eastern part of St. John's Peninsula. Crew # 5 was placed in an area known as Smith Lake, situated on the Leadbetter Peninsula. Mosquitoes produced here affect a small industrial center, as well as residents of the peninsula district. Crew # 6 was placed in the vicinity of Ramsey Lake, on the St. John's Peninsula, mosquitoes emerging from this area affect a small business center and residents of the St. John's Peninsula. Crews # 7 and 8 were located on Sauvies Island. Mosquitoes produced there cause serious economic losses to numerous dairy farms and migrate to North Portland where they become obnoxious pests to the residents of that vicinity. Crew # 9 was placed in the Blue Lake district, where the insects cause losses to an amusement resort and many dairy farms, as well as a great deal of discomfort and bother to the citizens of several small towns in that vicinity.

The engineering party worked throughout the county beginning with the areas known to be the most prolific producers of this insect pest.

During the period from April 1st, to July 1, 1936 five entomological scouts were employed to assist with direct control measures and to gather field data. As near as possible the breeding areas of Multnomah, County were divided into five equal districts, and a scout was assigned to one specific district.

SCOPE of the PROJECT

The scope of the project was to do considerable semi-permanent control, direct control by oiling, and to make contour maps of the mosquito-breeding areas situated in Multnomah, County. Semi-permanent control measures consisted of removing dense patches of willows and other brush from areas known to be heavy mosquito breeders.

By removing the brush and such debris as driftage and windfalls, the wind and sunlight is admitted. This clearing so changes the ecology that the areas become unsuitable for the oviposition of eggs.

Direct control was carried out by 5 oiling crews.

Contour maps of many of the most prolific mosquito-breeding areas were made.

BRUSHING

In all areas where the clearing crews were placed, the underbrush and willows were exceedingly dense, covering swales, pot-holes, and flats. (See Fig. 1) The labor crews consisting of one foreman and at least 25 laborers per crew, cleared all willows, windfalls, and driftage from these areas. Low overhanging branches were trimmed from trees, and in heavy groves some trees were taken out entirely. At the Oaks Bottom and Mocks Bottom areas, which are well within the city limits of Portland, willows were grubbed out by the roots, in order to make the work of a more permanent nature. Clearing of this type not only discourages oviposition by flood-water mosquitoes, but also makes the areas, some of which were previously inaccessible, penetrable for the oiling crews. Where the labor expenditure would warrant the work, considerable ditching was done to permit the flood water to recede when the river level returned to normal.

From the inception of the project to September 1, 1936, 1,136.07 acres of land were brushed and cleared, 8,644 lineal feet of ditching were completed, and 403 acres of infested water surface were treated during the oiling season, at a labor expenditure and cost of 134,005 man hours and \$ 61,897.15 .*

DIRECT CONTROL MEASURES

During the actual breeding season, in the spring, direct control measures were carried out by five oiling crews. Every crew was in charge of an entomological scout. Each scout was assigned 6 or more laborers to do the oiling with Meyer type knapsack sprayers. The scouts covered their districts several times a week, locating breeding situations by taking larvae dips with a hand dipper. When breeding was found, they directed the oilers to the locality to be oiled and supervised the actual work. Each scout was in complete charge of the oiling crew in his district and for the locations and amount of oil delivered to the stations used as oil depots. Consequently, the scouts were held responsible for the results obtained by oiling in their particular districts.

It was estimated that twenty gallons of oil was needed to cover one acre of water surface, and the scouts estimated the number of drums of oil needed in different localities on this basis.

The scouts also established flood-water markings, by blazing trees throughout their areas, and to some extent the most prolific breeding areas in their respective districts were plotted on rough maps.

*These figures are incomplete for the entire duration of the project, because our repeated requests, from the W. P. A. Division of Operation's office for the information necessary to compile this data were ignored.

After the adult insects had emerged, ten-minute collections were taken throughout the county, and the number of each species collected was determined and recorded in the laboratory.

On April 21st, when the river level was 10.7, the first hatching of larvae was found along the shores of Marquam Lake on Sauvies Island.

Because the mean temperature for the month of April was 55.6 degrees, which was 3.8 degrees above normal, the development of the larvae was more rapid than ordinarily necessitating an immediate start of oiling operations.

Oil spraying began on April 24th, when the river level was at a height of 12.3, and continued throughout the island until May 9th, when it was suspended because of the lack of oil. (-See Fig. 2-) Oiling operations also began in the other areas shortly after April 24th, ^{and} were suspended on May 9th, because of the oil shortage. By this time the river level was 16.4, and adult insects began and continued to emerge until the much needed oil was eventually received on May 18th. On this date the flood crest reached the height of 19.3, which was the peak for the month of May. On May 19th oil spraying again became possible and was resumed in all 5 districts. After June 1st, it became unnecessary to do anymore oiling on Sauvies Island which was inundated to such an extent that the remaining larvae were washed down the river. Spraying procedure continued in the remaining areas up to June 25th, on which date no larvae were to be found in the county.

ABNORMAL OCCURRENCE of the FLOOD-WATER CRESTS

Oiling conditions were made extremely difficult, this year, because of the abnormal occurrence of the flood-water crests. There were four distinct rises of flood water, each higher than the preceeding, making it necessary to oil the entire county four different times, because of the subsequent hatchings of four broods of larvae.

This unusual condition is decidedly contrary to the normal flood crest which usually reaches one peak then falls to the normal level.

On April 28th, the river height was 14.0 feet. From 14.0 feet a gradual ^{rise} began, and eventually the level of 13.3 was reached. The river then began rising, and on May 9th, the height of 16.8 feet was reached. From the 16.8 mark the river level fell to 15.5; the water then began to rise reaching the crest of 19.3 on May 18th. At this time another fall occurred stopping at the 16.4 mark. From this level the flood water began rising reaching the seasons' highest crest of 19.7 on June 11th. (See Fig. 2)

DISTRICTS and AMOUNT of OIL USED

In district A, which covers the entire north western part of St. Johns' Peninsula, a total of 1,580 gallons of oil were used to spray approximately 88 acres of infested water surface.

District B consisted of Hayden Island, Lotus Island, and the mosquito-breeding areas along the Columbia River to the western boundary of the Blue Lake district. In this area 1,521 gallons of oil were needed to spray 84.5 acres of infested water surface.

The Oaks Bottom, Hardtack Island, Ross Island, and the mosquito-breeding areas along the western shore of the Willamette River comprised district C. Oil used in this area covered approximately 36 acres of infested water surface, 645 gallons being needed.

District D consisted of all of Sauvie Island within the boundaries of Multnomah County. In this area 1,389 gallons of oil were used to cover approximately 77 acres of infested water surface.

The mosquito-breeding grounds around Blue Lake and the town of Troutdale were known as district E. In this area considerable oiling was done from a boat using a hand-powered-force pump and several hundred feet of hose. Approximately 117.5 acres of infested water surface were covered in this area by using 2,122 gallons of oil.

In Multnomah County during the direct control campaign, a total of 7,257 gallons of diesel-fuel oil were used to cover 403 acres of larvae infested water surface at a cost of \$ 45.51 per acre for supervision, labor, and oil.

METHOD and WORK of ENGINEERING PARTY

The engineering party consisted of a surveyor, topographer, rodman, chainman, draftsman, and two axemen. As a general rule the method followed by the engineering party in gathering field data consisted of three steps. The first step was to establish a horizontal control consisting of a main traverse and several sub-traverses. The second step was to establish a vertical control, which was done by designating the elevations of all points on the horizontal control. The last step was to directly locate the contours by using a hand level and chain. Other topographical features such as lakes, sloughs, roads, and other prominent landmarks were located by direct chaining. Notes and other data taken in the field were brought into the office and the draftsman plotted the information on outline maps of the sections surveyed.

Although not completed for the entire county, the maps show to a large extent the important breeding grounds along the Columbia and Willamette Rivers and the affect of various crest heighths upon them. The maps will be of considerable benefit to any mosquito control work done in the county in the future.

INSECTS INVOLVED

Control measures were directed against two species of flood-water mosquitoes, Aedes vexans Meig. and Aedes aldrichi Dyar and Knab.

The places of oviposition of these species are somewhat similar as to ecology, but as a rule the majority of A. aldrichii larvae hatch from eggs deposited on higher ground than those of A. vexans. (See Fig. 3) The typical well shaded and protected cottonwood and willow swales along the shores of the Columbia and Willamette Rivers provide ideal breeding situations for these two species. An abundance of larvae were also found along the shores of many lakes on Sauvie Island. The water levels of these lakes are affected by the rise and fall of the river level.

ECONOMIC STATUS of INSECTS INVOLVED

Recreation centers such as amusement parks, golf courses, tourist camps, and public bathing beaches are seriously affected by these insect pests. People who pay for privileges do not wish to be annoyed by insects; consequently businesses of this type suffer greatly from a lack of patronage during the season mosquitoes are prevalent.

Numerous dairy farms along the Columbia and Willamette Rivers, particularly on Sauvie Island and in the Blue Lake district, suffer severe losses because of mosquitoes. Several dairy farmers, situated on Sauvie Island, reported milk production fell off 25% during the mosquito season.

To give a quantity of milk a cow has to be well fed and contented. During the spring of the year, when green feed is most plentiful milk production should be at its height, but the mosquitoes worry and torment the cows to such an extent that they can not feed. In areas where the insects are numerous the cattle often refuse to go to pasture; consequently milk production falls off considerable.

Many residents are unable to derive any pleasure or enjoyment from their yards and gardens during the mosquito season. Several citizens complained, because the insects entered their homes at night and made sleeping with the windows open impossible.

Real estate agents find it difficult to rent property or sell homes in localities where mosquitoes are known to be a nuisance.

Lumber camps, road crews, and other types of outdoor employment are affected materially during the season the insects are pests. A laborer can not do efficient work when he spends a great deal of his time fighting mosquitoes.

Small fruit farmers, berry ranchers, and truck gardeners are also affected to a certain extent, as the insects prove bothersome to the workers in the fields.

In some localities A. vexans carry fowl pox from ranch to ranch, causing losses to chicken ranchers.

RESULTS and METHODS of DETERMINING EFFICIENCY of CONTROL MEASURES

For the past five years the city and county have done a certain amount of control work depending on the size of the funds appropriated for work of this nature.

Consequently, it is rather difficult to state the exact percentage of control achieved this year. However, in comparing the ten minute collection tests for the year of 1935, when a small amount of control work was done, with the tests taken during 1936 some indication of the percentage of control obtained is shown. In 1935, 37 ten minute collection tests were taken. The average number of mosquitoes collected for each test was 24. In 1936, 91 ten minute collection tests were taken with an average of 7 mosquitoes per collection. The highest number of mosquitoes collected during any one test taken on Lotus Island during 1935 was 105. The highest number taken at the same location by the same collector during 1936 was 38.

The results of the direct control measures were seriously handicapped by the shortage of oil during the spraying season. Numerous adults throughout the county emerged during the nine day period the project was without oil, and the control crews were helpless to do anything about it.

The delay in getting oil was occasioned by the Division of Operations' office of the W. P. A. who, in order to secure oil for some other W. P. A. project, added \$ 250. worth of oil to the original requisition. The State Purchasing Department of the W. P. A. detected this discrepancy and refused to honor the requisition, because of insufficient funds in the project budget. Consequently, it took a period of nine days to straighten out this difficulty.

Each year before direct control measures are started, larvae counts are made throughout the county. These counts are made by taking ten dips with a hand dipper and recording the average number of larvae per dip. In the spring of 1937 when the larvae hatch, collections taken may be compared with those taken during 1936. The data obtained by this method will show either a greater or lesser amount of adults survived and oviposited during the spring and summer of 1936. During the winter months of 1937 samples of sod may be brought into the laboratory and flooded. The number of larvae hatching from these sods can be compared to those taken from sods flooded during the previous winters. By this process another check on the percent of control established is obtained.

Although the mosquitoes were obnoxious pests in some sections of the county, considering the difficulties encountered in obtaining oil, and the unusual number of flood-water crests a fair control was established throughout the entire county.

PAY PERIOD REPORTS and ANALYSIS

A complete and detailed report was prepared for each of the following, technical advisor, sponsors, residential engineers, and the project office. These reports showed the number of acres cleared, office supplies and equipment ordered, number and type of injuries, number of employees and occupational classifications, and the cost of operating the project during the pay period for which the report was prepared.

Many difficulties were encountered during the year. The extremely cold weather during the months of February and March made conditions in the field miserable. A large number of the laborers were poorly clad working in snow, wind, rain, and mud with light clothing, low shoes, and no hats or gloves.

Little experience was had with labor agitators, although several attempts were made to organize W. P. A. laborers into a union. On the whole the men seemed very happy to be working instead of being on direct relief. There were few cases of insubordination, and it was only necessary to release four laborers on this charge. As a general rule the men were willing to work and carry out the orders issued by the foremen.

In some cases aged and physical unfit men could not accomplish the work in the field, as well as the younger men. A point was made to try and place these individuals in jobs requiring a small amount of physical effort, such as water boy, tool man, first aid man, or car watchman.

W. P. A. REGULATIONS

The numerous rules and regulations of the W. P. A. were never stated or submitted verbally or in writing. Naturally, members of the supervisory staff were never aware of the fact that some offense had been committed until they were informed by the resident engineer or other members of the W. P. A. Division of Operations. For instance, in one locality several men spent three days repairing a private road, because the property owner had insisted that the men maintain the road or he would not permit them to use it. Although many hours were saved by using the road, and it was a great convenience to all concerned, saving several miles walk, the W. P. A. engineers criticized members of the supervisory force severely for permitting the men to repair the damage they had caused to the road.

It was necessary to fill out as many as 9 detailed blanks before an injured man could receive medical treatment, at the United States Public Health Service where all W. P. A. injuries were reported. In order to release a man, 7 forms had to be filled out with three signatures required for each form before they were official. Strict rules also governed each occupational classification, and a man assigned to a position could not do any similar work to the position he had accepted. As an example, a cabinet maker could construct a cabinet, but he could not finish it with a varnish stain, because that type of work called for a man with a painters classification.

All supplies were ordered by requisition, and it was often several weeks time before the requisitions passed through the proper channels to eventually be filled.

PSYCHOLOGICAL ASPECTS

The office of the Division of Operations was made up of a group of resident engineers in charge of various W. P. A. projects. The attitude taken by these so called engineers was anything but cooperative. * They could not see any reason for employing a technically trained person to supervise a project consisting of work of a scientific nature. To them no knowledge of the life cycle, characteristics, and environment of mosquitoes was necessary to do good mosquito-control work. In their opinion a labor foreman would make just as good a supervisor, as a man with a Master of Science degree and several years experience in mosquito-control work.

After July 1st, when the W. P. A. engineers took over direct charge of the work in the field, without any technical supervision, approximately 40% of the work done could not be classed as mosquito-control work. High ridges never flooded by flood water were cleared, large standing timber some $1\frac{1}{2}$ feet in diameter was cut, and underbrush along the river banks, where strong currents would kill any larvae, was cleared. Many situations where no self respecting mosquito would oviposit were cleared of all vegetation. Some of the things done were the exact things the previous supervisory force were criticised for doing. Not once did they consult H. H. Stage Technical Advisor, as to the manner and ~~procedures~~ to be carried out in any of the areas. In one instance a crew was removed from a prolific breeding area and sent to another locality some 25 miles distance without the technical advisor or sponsors being informed until the change was completed.

At one time Captain Hardy United States Army Engineer and Investigator, was called by the W. P. A. engineers to inspect the work. A complete investigation was made without the knowledge of the technical advisor, superintendent, assistant superintendent, or sponsors. Although Capt. Hardy knew nothing of mosquito-control work and admitted he knew nothing of the procedure being followed, he felt qualified to state that the integrity of the work rated only from fair to poor. (See attached copy of answer to Capt. Hardy's report.)

Before the reorganization of the project, the Game Management Agent of the Biological Survey was taken to all localities where crews were working, in order to determine if wilde life breeding grounds were being disturbed or destroyed. In no instance were any violations found, and the wishes of the Biological Survey were respected at all times.

* The title of Residential Engineer, was given to all individuals working out of the W. P. A., Division of Operations' office. To my knowledge none of these men were bona fide engineers.

Many enthusiastic responses both verbally and written were received from the general public expressing a wish for the work to be completed, because all citizens of Multnomah County would benefit and derive pleasure from the freedom of mosquitoes during the spring and summer months. In some cases petitions were signed by a great many people praising the work.

SUMMARY *

| | |
|--|--------------|
| Total man hours foremen and laborers.----- | 134,005 |
| Total salaries foremen and laborers.----- | \$ 61,897.15 |
| Total salaries professional and technical.----- | \$ 1924. |
| Total feet of ditching completed.----- | 8,644 |
| Total acres of land cleared.----- | 1,136.07 |
| Average cost of brushing, burning, and ditching per acre.- | \$ 54.48 |
| Total acres of water surface treated by oilers.----- | 403 |
| Average cost of supervision, labor, and oil for treating one acre of water surface.----- | \$ 45.51 |
| Average number of gallons of oil necessary to cover one acre of water surface. ----- | 18 |
| Total gallons of diesel-fuel oil used in Multnomah, County. * ----- | 7,257 |

See attached sheets for tool and equipment inventory.

*These figures are for the months between December 23, 1935 and September 1, 1936. Data for the other months could not be obtained. (See foot note P. 5)

*At the time the oil was purchased the price was .05.75 cents per gallon.

Tools and equipment used on W. P. A. Project 606, Mosquito Control.

| | |
|-------------------------|-------|
| Tool boxes | 7 |
| Padlocks | 11 |
| First Aid Kits | 9 |
| Cross-cut saws | 17 |
| Brush hooks | 51 |
| Mattocks | 42 |
| Handles P.&M. | 36 |
| Handles (various) | 11 |
| Brush scythes | 19 |
| Snaths | 15 |
| Forks | 20 |
| Hay Forks | 24 |
| R. P. shovels | 78 |
| Milk cans | 11 |
| Buckets | 7 |
| Dippers | 6 |
| Files (miscellaneous) | 87 |
| Magnifying glass | 1 |
| Surveyors crayons | 1 dz. |
| Double bit axes | 119 |
| Iodine applicators | 26 |
| Ammonia inhalants | 5 |
| Adhesive compresses | 65 |
| Triangular bandages | 9 |
| Eye dressing | 6 |
| Adhesive tape | 6 |
| Ungentine | 13 |
| Tannoid | 5 |
| Poison Ivy lotion | 1 |
| Calomine lotion | 4 |
| Cotton | 1 |
| S. B. axes | 3 |
| Wedges | 19 |
| Sledges | 11 |
| Peavies | 12 |
| Steel tape | 1 |
| Plumb bobs | 2 |
| Hand level | 1 |
| Engineering flags | 2 |
| Hasp | 1 |
| Mauls | 7 |
| Pickaroons | 2 |
| Scythe stones | 4 |
| Stadia rod | 1 |
| Level | 1 |
| Transit | 1 |
| Staff and compass | 1 |

Office and drafting supplies.

| | |
|------------------------|---------------|
| Letterheads | 1/2 ream |
| Plain bond | 2 "" "" |
| Second sheets | 2 "" "" |
| Envelopes (franked) | 100 |
| Scratch pads | 1 dz. |
| File folders | 100 |
| Alphabetical Index set | 1 |
| Steno. note books | 1 dz. |
| Carbon paper | 1/2 dz. boxes |
| Typewriter ribbons | 2 |
| Remington line-a-time | 1 |
| Metal waste basket | 1 |
| Pencils | 3 dz. |
| Erasers | 1/2 dz. |
| Pen holders | 1/2 dz. |
| Royal typewriter | 1 |
| Pen points | 1 box |
| Ink | 1 quart |
| Salem bond #16 | 1 ream |
| Canary fibre | 1 ream |
| Tracing cloth | 15 yds. |
| Vellum paper | 6 yds. |
| India ink | 2 bottles |
| Thumb tacks | 1 box |
| Gillot pens | 2 dz. |

Oiling equipment

| | |
|------------------------|--------|
| Row boat(24') | 1 |
| Row boat(12') | 1 |
| Row boat(18') | 1 |
| Outboard motors | 3 |
| Life cushions | 17 |
| Power sprayer and hose | 1 |
| Knapsack sprayers | 22 |
| Hip boots | 24 pr. |
| Car trailers | 2 |
| Nozzle washers | 1 box |
| Dippers (larvae) | 5 |
| Row boat oars | 2 pr. |
| Drum faucets | 4 |
| Hand axes | 5 |
| Five gallon gas cans | 2 |
| Funnels | 4 |
| Supply tanks (5gal) | 2 |

Copy of answer to Capt. Hardy's report.

March 25, 1936

Mr. Burton E. Palmer
Director - District No. 2
Portland, Oregon

Mr. W. L. deWitt
Supervisor of Operations
District #2 W. P. A.
Portland, Oregon

SUBJECT: Operating Procedure
Project No. 606

Gentlemen:

It is greatly regretted by this office that an apparent lack of cooperation and efficiency on Project 606 has become a matter of concern to the executive offices of the W. P. A. As far as I am concerned these factors should be above reproach and I will do everything within my power to correct them to the satisfaction of all. This is a simple statement of our policy and has nothing whatsoever to do with any past criticism of our work.

I will take up the points outlined in Mr. Palmer's letter of March 19th and in that he has presented them.

1. It is difficult to understand Captain Hardy's report where in he shows "progress of work" and "integrity of work" as fair to poor. Under "progress of work" we certainly have no apologies to offer. We have taken untrained men, poorly clothed, into the fields to which they are unaccustomed and under severe weather conditions have made excellent progress. During the first thirty days, the progress was considerably handicapped through lack of tools, particularly axes. During the first pay period our 71 laborers had no axes, and at the end of the second pay period our 190 laborers had but approximately 90 axes. During the month of February the weather was extremely cold and the ground frozen. We were, however, unwilling to close down the project, as many of the other projects did, because we felt that the men needed the work, although progress was necessarily retarded. The quality of tools has also been somewhat a matter of hindrance. The saws particularly after filing and upon being delivered into the field, had been subjected to such rough handling that they were of little use.

In spite of all these inconveniences, and we are not complaining of these inconveniences because we understand the difficulties in overcoming them, we have cleared a total of 452 acres and dug 5, 295 lineal feet of ditch at an approximate cost of \$ 63.00 per acre. Progress has also been slow because we have been doing a much more thorough job than ordinary clearing. We have actually grubbed out the smaller willow roots so that the work would remain as nearly permanent in character as possible. This is true in the most important mosquito areas within the city limits, such as the Oak's and Mock's Bottoms. With the exception of three non-relief foremen who had experience with us during the C. W. A. or S. E. R. A. work, everyone on the project was new and it took some time of course to familiarize themselves with the kind of work.

As to the " integrity of the work ", it is again difficult for us to imagine just what may be implied. From our standpoint, it would seem that practically every individual living within the county would benefit from mosquito control. Several businesses are affected, such as golf courses, amusement parks, tourist camps, and the dairy and poultry industries. There is no occasion for a political favor and, believe it or not, favoritism has not been shown. Every area in which we have worked is a proven breeder of mosquitoes and such can be established at the present time by taking sod samples, bringing them into the laboratory and covering them with water.

During the Civic Emergency Relief work in 1931-32, the work of clearing mosquito areas was first started with the main thought that the areas would be more accessible during the oiling season. It was then observed in subsequent years that the cleared areas no longer produced mosquito larvae. We had therefore established a satisfactory and more or less permanent method of control because the insects' most favorable habitat had been destroyed. This information, we think, is an important contribution to our knowledge in controlling the mosquito pest.

Captain Hardy states that the " project was not properly set up nor satisfactory working procedure agreed on prior to its inauguration ". We believe the project is properly set up both in kind of supervision, number, and classification of personnel and general method of procedure. It must be remembered that when the project was approved, the first question asked by the W. P. A. offices was " When can you put the men to work. " Our response was that it could be done immediately and within a week's time that is just what was done without a great deal of wasted effort. Moreover, the project was in operation a full week before we were visited by the Resident Engineer.

We have had two meetings of all the foremen on the project. These meetings were attended by the timekeeper, our superintendents, and the City Insectarian, but although Mr. Deaver was requested to attend, he did not.

Some criticism is made of the "large amount of labor which has been spent on clearing of trees, cutting wood and repairing roads on private property, benefiting a few property owners but with comparatively small value to mosquito control." The most important phase of our project, as stated in the original application, was the very matter of clearing trees and brush in mosquito breeding areas. When necessary we thought it advisable to cut up larger trees, and in some instances we have arranged with the laborers to take home the wood after working hours if they so desired. This policy may have been an error, but it not only helped the men who did not have a great deal of money to buy wood with it also saved the crews the task of burning large pieces of wet wood under adverse weather conditions. We find ourselves questioning Captain Hardy's ability to judge the value of clearing in relation to mosquito control.

It is true we have repaired private and county roads but only where they were destroyed by our forces or in instances where a little maintenance was necessary to drive nearer the work. The roads so repaired are not only temporary use to the clearing crews but will become even more valuable to the transportation of oil to these remote areas during the breeding season. The repair of all roads, however, does not exceed 23 man days. It is true that a few property owners have been greatly benefited but I can see no way of correcting such a condition.

Captain Hardy recommends "that maps be prepared to show the work planned and the progress made". This meets with our approval, although it is difficult to show exactly on the available maps the extent of a few acres. We have maintained in our office a road map of Multnomah County on which pins have been placed to show the location of the various crews and the total number of acres cleared in that area. This map has been kept up to date in every particular. In addition, to this map, we receive daily reports from the foremen of each crew giving a statement of the kinds and amounts of work completed. Also, Mr. Cody, the assistant superintendent, has made up a report at the end of each pay period giving a brief resume of the work performed by each crew, a budget analysis, remarks on injuries occasioned and a summary of costs, as well as a total inventory. A copy of this report has been sent Mr. Deaver at the end of each pay period.

Another recommendation of Captain Hardy's is "that clearing be limited to brush in low areas". This is exactly what we are doing and no authority has ever been given to clear land above what we know as a 24' flood stage.

As far as I know, these instructions have never been violated.

Captain Hardy finally states " that a larger proportion of work should be spent on construction of ditches from the breeding areas to the natural drainage courses ". The construction of ditches in our area is of but small consequence and has very little to do with the control of mosquito breeding. It is true that the construction of ditches would allow the water to flow out of the breeding grounds as flood water recedes, but this is of little concern since the adult mosquitoes have by that time long since emerged. In other words the eggs hatch immediately on being flooded by the rising waters and there will be no subsequent broods. This is in contrast to the breeding habits of most mosquito species as the layman ordinarily understands them, viz: malaria mosquitoes, salt marsh mosquitoes, and many other species which are pests in other parts of the country and do not lay their eggs on stagnant water. However, such is not the case with the genus Aedes, the type which we have throughout the Northwest and which we are attempting to control along the Columbia River.

2. We have no remarks to make concerning Mr. Ivan E. Osake's letter since I am in perfect accord with having amiable cooperation or closing down the project.

3. In regard to Mr. deWitt's recommendation of March 6th, I do feel that it would have been a matter of courtesy and good business ethics to have a conference between this office and the Engineering Department before such a strong recommendation as closing down the project was made.

4. I cannot refute Mr. Deaver's reports since I have no idea what they contain. It is to bad that these arguments were not discussed between ourselves. Had they been, I am sure they could have been settled to everyone's satisfaction. If not, we could have immediately asked someone in authority to set us straight. I attempted to do this very thing with Mr. Bailey but was told that my name was of no consequence to the project, since I was but a technical advisor.

5. You will note that I was concerned at an early date in regard to the conduct of the work, since on January 9th, a letter was written by me attempting to more clearly define responsibility and to place the project on a business like basis. The letter was prompted by orders which had been given the foremen by Mr. Deaver and Mr. Bailey regarding the kind of work to be done. It is, of course, apparent that after orders of this kind the foremen had no idea who was in charge and to whom they should look for their final authority. It is quite possible that we exceeded our authority in such instance, but we had no regulations from the W. P. A. offices defining their responsibility and ours.

Accordingly the work was continued in such the same manner as was done during the C. W. A. and S. E. R. A. programs. If we exceeded our authority, I shall be happy to rescind that communication and shall do so when the respective responsibilities are understood.

6. Mention is made of reports by the Resident Engineer specifying specific cases in which encroachments had been made upon the rights of the W. P. A.. Personally, I do not understand nor know of one such instance, and if this has been done we were not aware that we were violating any of the regulations. In accordance with Mr. Palmer's letter of the above mentioned date and under his summary on page 4, we would like to announce our willingness to strictly adhere to his recommendations.

1. A memorandum will be made in writing to this district for the guidance of the Resident Engineer and will be issued prior to the placing of men in the field. This memorandum shall carry the recommended procedure as to what should be done and to define as clearly as possible the limits controlling such operation.

2. In the future this office will not concern itself with the actual placing of W. P. A. men on the project. This office will also issue instructions to foremen that they must take orders from W. P. A. engineers covering operation and safety features, and we will endeavor for a harmonious relationship between the W. P. A. engineers and ourselves. I am sure this can be done with the present understanding of authority and the limitations of each.

3. On March 25, Mr. Bailey and Mr. Deaver made inquiries regarding the clearing and something of the areas which had been oiled in the past of at least 3 of the foremen. How can they reasonably expect an explanation from these foremen since these foremen - that is, six of the nine - were taken from the relief rolls and have never had experience on mosquito control work? They are only working as directed by the superintendents.

Very truly yours,

H. H. Stage,
Associate Entomologist,
U. S. Bureau of Entomology
& Plant Quarantine.

Copies to: Mr. Oakes
Captain Hardy
Mr. Bailey
Mr. Deaver

Figure 1.



An ideal breeding area in Multnomah County which is subject to flood by the annual rise of the Columbia River. An area of this type offers a maximum of protection from wind and sunlight, and is extremely difficult to oil, when flooded, because of the dense growth.



The same area as above after willows, driftage, and underbrush were cleared facilitating oil spraying, and changing the ecology to such an extent that egg laying is greatly discouraged.

Figure 3

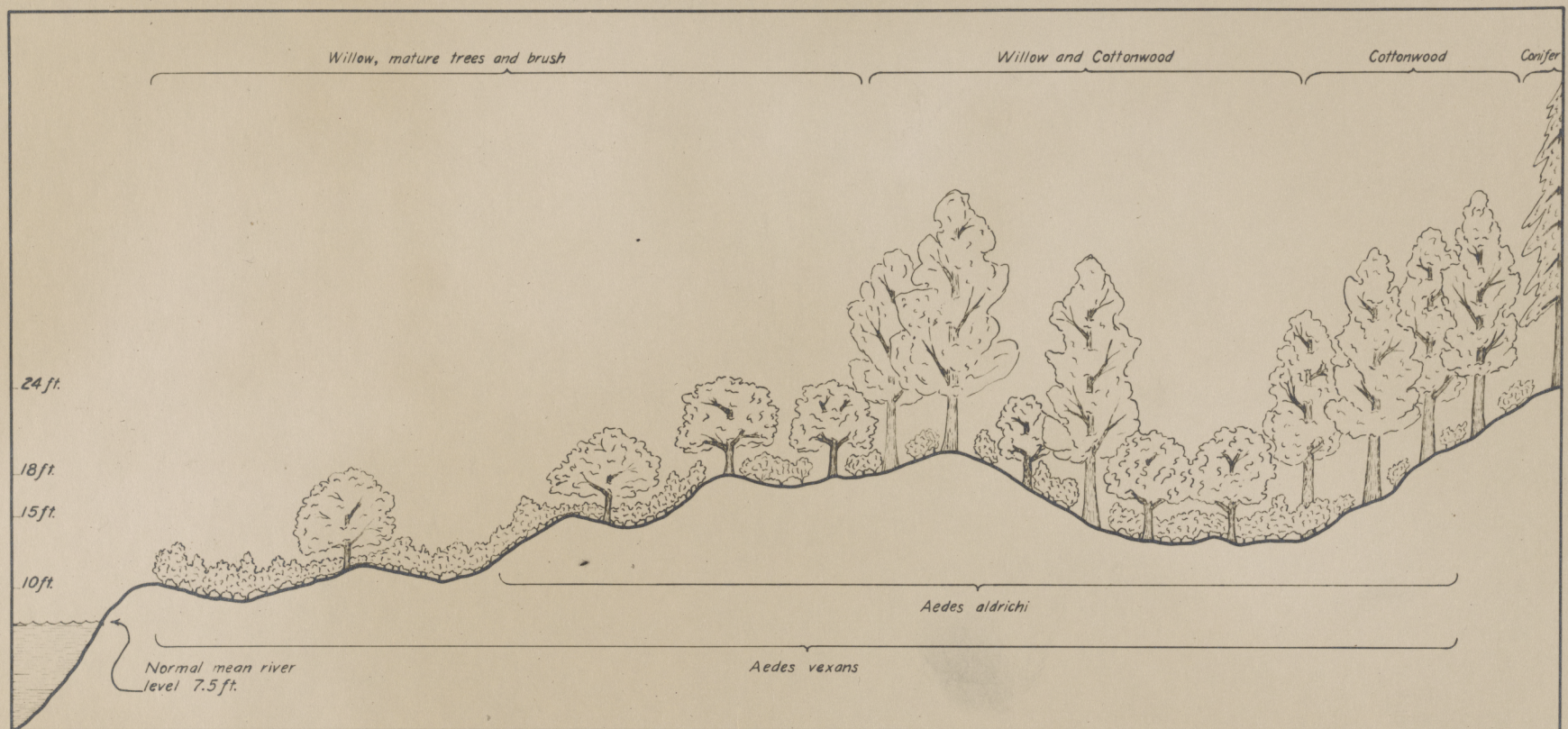


Diagram of profile of Columbia River bank in Multnomah County, Oregon, showing relative altitudes of breeding grounds of the two pest mosquito species common in the county.